

**APPENDIX B**  
**Watershed-Based Stream Corridor Management and Protection Plan Recommendations**



# **Watershed-based Stream Corridor Management and Protection Fort Belvoir, Virginia**



**Final Report  
Prepared for the  
Environmental and Natural Resources Division,  
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## RECOMMENDATIONS AND CONCLUSIONS

Fort Belvoir presently possesses numerous streams with adjacent riparian forests that have quite a diversity of both aquatic and terrestrial habitat. In most cases, these streams are adequately protected by riparian forest buffers. This is primarily due to most of the post's development activities being on tops of ridges and plateaus as opposed to being located right next to perennial streams. Because these development activities are located in this topographic position, their storm water runoff feeds directly into steep draws and valleys through drainage ways and culverts. Often, this drainage is accomplished without the benefit of detention and/or infiltration facilities, particularly on the South Post more than the North Post. Concomitant with the direct discharge into these draws and valleys are a number of erosion producing factors: 1) too much storm water runoff in many cases; 2) lack of proper number, size, and configuration of culverts; 3) lack of or improper energy dissipation below culvert outlets; and 4) lack of a regularly scheduled inspection and maintenance program of storm water facilities, i.e., detention basins, drainage ways, and culverts. The combination of the above factors sets off an erosion cycle that usually begins at the outlet point of the culverts. The energy from the discharged water falling from these culvert outlets causes scouring of the drainage channel. Too much storm water runoff, particularly on the South Post (the older post), downcuts first the gullies, then widens them, and often continues this action down into first and

second-order streams lower in the watershed. Accompanying this downcutting and widening of gullies is considerable sediment that may carry with it pollutants in the storm water. These sediments and pollutants can adversely affect the health of aquatic and riparian ecosystems in the lower watersheds unless adequately addressed in the upper watershed.

The above erosion problems attributed primarily to present conditions of storm water runoff and inadequate drainage as a result of existing urban development can be addressed with action items delineated below. Before these are given, however, potential future problems need to be highlighted as a function of future development by incoming tenants. Namely, development in the so called "butterfly area" can have extreme consequences to riparian corridors below the ridges on which these developments will be placed. These consequences, of course, can be prevented if adequate plans for protective storm water runoff and riparian forest buffer systems are in place before construction begins.

### Action Items

- **Update and maintain storm water detention, infiltration, and runoff facilities for existing developments, i.e., parking lots. Provide or establish:**

An entity within the Directorate of Installation Support as responsible for establishing an ongoing and systematic

maintenance and repair program for storm water management. Such a program would include: continual inspections and maintenance/repair of existing storm water infrastructure, an inventory of all structures, an assessment of conditions/repair needs, and funding for the above items.

Additional detention and infiltration facilities around existing structures and parking lots, e.g., Community Club, hospital, golf course. These should use environmentally - friendly designs, such as a wet-pond detention system, an infiltration trench, porous asphalt pavements, and level/spreader vegetative filter strips shown in Appendix A.

Energy dissipation for all existing culvert outlets in accordance with treatments proposed in the report and in Appendix B. Specific solutions should be implemented for specific areas as noted in the report.

Immediate maintenance to structures posing a safety hazard, as noted in the report.

A systematic program to effect corrections to drainage way and stream bank problems noted in Landgraf 1999 a, b, c.

- **For prospective incoming tenants that require new construction, a policy should be developed for the Post Commander that requires a**

**storm water management plan from these tenants. This plan must meet requirements of staff agencies, such as the ENRD and Directorate of Public Works.**

Fort Belvoir should establish its own site-specific regulations (in addition to local regulations) for storm water management as related to new tenants and new construction. Local regulations require storm water management plans for developments exceeding five acres and may be fine for cities such as Alexandria. Fort Belvoir's new developments are being placed into areas that already have excessive and unmanaged storm water. These actions cause unacceptable runoff that exceeds pre-project conditions and therefore require more stringent plans for storm water management as a pre-requisite to construction.

New facilities should be established in previously disturbed sites rather than clearing new land.

New developments should limit impervious systems, e.g., use multi-level structures for parking rather than create more large, surface parking lots. Parking lots, if needed, should incorporate infiltration systems such as rain gardens.

- **Nickpoints or headcuts in streams and gullies working their way upstream should be assessed for the need to establish grade control**

structures, such as low head stone weir, discussed in the report. Use of these should be evaluated based on an assessment of risks to infrastructure and/or critical habitat in light of costs.

Riparian forest buffer composition and widths, particularly for new construction, should be established in accordance with guidelines based on review of the scientific literature outlined in this report. This should be done with the understanding that there may be some compromises of width due to political and economic constraints. Thus, coordination among staff agencies responsible for construction and those responsible for natural resources is essential.

- Provide training to installation and contract staff responsible for storm water management. Appropriate training can be obtained from short courses sponsored by such organizations as the International Erosion Control Association (IECA). Some examples of these courses include: *Practical Approaches for Effective Erosion and Sediment Control; Design Procedures for Channel Design and Streambank Stabilization; Reducing Erosion and Managing Sediment on Construction Sites; Hydrology and Hydraulics for Erosion Control Professionals; How to Put the BEST Back Into Your Best Management Practices (BMP's)*. Information for IECA courses can be received by accessing their web page at <http://www.ieca.org>